



## INGECON® H2 E-Series

### ELECTROLYZER RECTIFIER BASED ON IGBT TECHNOLOGY

#### The maximum DC current density

The INGECON® H2 E-Series rectifiers feature the largest DC current density on the market, with up to 6,000 A/dc of rated current. Thus, it is the best solution to feed the electrolyzers with DC power from renewable energy generation plants.

#### Latest generation electronics

The INGECON® H2 E-Series rectifiers are based on Ingeteam's latest-generation IGBT technology, that enables AC-to-DC power conversion with no need of any additional harmonic filters nor STATCOM units, thanks to Ingeteam's THD (total harmonic distortion) lower than 3%.

These converters feature a very low power consumption thanks to an efficient power supply electronic board.

Furthermore, the hardware of the control unit allows accurate measurements and very reliable protections.

#### Flexible configuration

These rectifiers feature several power stacks, allowing to connect the DC output to one or several electrolyzers working independently.

#### Improved medium voltage integration

These rectifiers have been designed in order to facilitate a direct close-coupled connection with the MV/LV transformer. Thus, Ingeteam offers an all-in-one power station that is capable to perform MV to LV conversion while also converting from AC to DC.

#### Liquid Cooling System (LCS)

The LCS is a closed circuit supplied totally filled and purged, equipped with fast connectors with an anti-dripping system, so it offers zero risk of particle entrance. It has been designed to avoid siphons in order to easily purge it if necessary. The coolant used is a biodegradable glycol water mixture. There is no need of emptying the LCS in order to replace the phases, nor the sensors.

# INGECON® H2 E-Series

## Electrolyzer rectifier based on IGBT technology

### Long-lasting design

The rectifiers have been designed to guarantee a long life expectancy, as demonstrated by the stress tests they are subjected to. Standard 2-year warranty, extendable upon request.

### Ease of maintenance

All the elements can be removed or replaced directly from the rectifier's front sides, thanks to its new design.

### Protections

- DC Reverse polarity.
- Short-circuits and overloads at the output.
- Insulation failure DC.
- Lightning induced AC surge arresters, type II.
- Motorized DC isolator.
- Motorized AC circuit breaker.
- Hardware protection via firmware.
- Additional protection for the power stack, liquid cooled, IP65 rated and air cooled by a closed loop.
- Integrated stack discharge system.

### Easy to operate

The INGECON® H2 E-Series rectifiers feature a number of LEDs to show the rectifier operating status with warning lights to indicate any incidents. All this helps to simplify and facilitate maintenance tasks.

### Enhanced protection system

The rectifier is securely connected to the electrolyser using a pre-charge system that smoothly controls the DC current during the electrolyser start-up. Additionally, as an option, the converter can include a

### Optional accessories

- Lightning induced AC surge arresters, type I+II.
- Electrolyser discharge system.

### Liquid cooling system

- LCS to refrigerate the IGBTs.
- More optimized component usage: greater thermal stability.
- Less moving components: lower power consumption and less maintenance works.
- No risk of particle entrance.
- C5H anti-corrosive rating with stainless steel components.
- LCS is used in many industries. Thus, it is very reliable, as its components are subject to many validation tests.

flushing system to ensure safe access to the electrolyser for O&M works.

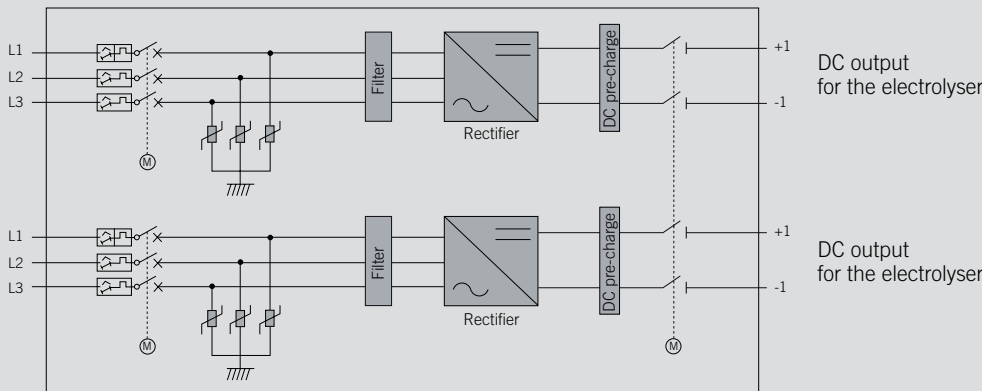
### Monitoring and communication

Wi-Fi and dual Ethernet communications supplied as standard. Also included at no extra cost the monitoring applications to record and monitor the rectifier's internal operating variables through the Internet (alarms, real time production, etc.). Two Ethernet communication ports available (one for monitoring and one for plant controlling), allowing fast and simultaneous plant control.

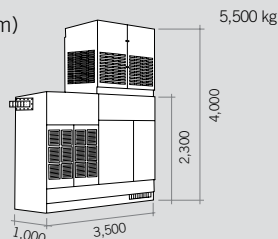
- Fast connectors with anti-dripping system
- Biodegradable glycol water mixture.
- No need of emptying the LCS in order to replace the phases, nor the sensors.

### Advantages

- Higher current density.
- Latest generation electronics.
- More efficient electronic protection.
- Enhanced performance.
- Easier maintenance thanks to its new design and enclosure.
- Lightweight spares.
- Components easily replaceable.



### Size and weight (mm)



## INGECON® H2 E-Series

## OUTPUT (DC)

Voltage Range <sup>(1)</sup>	330 - 1,300 V
Maximum voltage	1,300 V
Rated current <sup>(2)</sup>	6,000 A
Maximum current	7,700 A
DC current ripple <sup>(3)</sup>	<3%
Type of connection	Connection to copper bars
Number of outputs <sup>(4)</sup>	2

## OUTPUT PROTECTION

DC Pre-charge	Protection system to control the DC current during the electrolyser start-up
DC switch	Motorized DC load break disconnect
Other protections	Insulation failure monitoring / Electrolyser stack discharge system

## INPUT (AC)

Current (35 °C / 50 °C)	7,200 A / 6,200 A
Rated voltage <sup>(1)</sup>	240 - 690 V IT System
Frequency	50 / 60 Hz
Power Factor adjustable	Yes, 0-1 (leading / lagging)
THD (Total Harmonic Distortion) <sup>(5)</sup>	<3%

## INPUT PROTECTIONS

Overvoltage protections	Type II surge arresters (type I+II Surge arresters)
AC breaker	Motorized AC circuit breaker
Other protections	AC short circuits and overloads

## FEATURES

Maximum efficiency	98.9%
Euroefficiency	98.5%
Max. consumption aux. services	15,000 W
Stand-by consumption	370 W

## GENERAL INFORMATION

Operating temperature	-20 °C to +60 °C
Relative humidity (non-condensing)	0 - 100%
Protection class	IP65 <sup>(6)</sup>
Corrosion protection	External corrosion protection
Maximum altitude	4,500 m (for installations beyond 1,000 m, please contact Ingeteam's hydrogen sales department)
Cooling system	Liquid cooling system and forced air cooling system with temperature control (400V 3 phase + neutral power supply, 50/60 Hz)
Air flow range	0 - 36,000 m <sup>3</sup> /h
Average air flow	24,000 m <sup>3</sup> /h
Acoustic emission (100% / 50% load)	57 dB(A) at 10m / 49.7 dB(A) at 10m
Marking	CE
Compliance with	NFPA70, CSA C22.1
Certification	IEC 62477-1, UL1741 Ed.3, CSA C22.2 No 107.1, IEC 60529, CISPR11 (group 1 class A in-situ measurements), IEC 61000-6-2 (in-situ measurements), IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-14, IEC 60068-2-68

## Notes

- (1) For lower voltage values, please contact Ingeteam.
- (2) This rated current has been calculated for  $V_{dcmin}=720$  V;  $V_{dcmax}=900$  V; ambient temperature 35 °C.
- (3) At nominal conditions when point of connection (POC) is compliant with IEC 61000-3-6.
- (4) These outputs could be connected to the same electrolyser or to two different electrolysers.
- (5) For  $P_{out}>25\%$  of the rated power and voltage in accordance with IEC 61000-3-4.
- (6) Except for the LC filter and the air-water heat exchanger, that are IP54.